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In re Application of:

Corisis et al. ✓

Serial No.: 09/864,698 ✓

Filed: May 23, 2001 ✓

For: LEAD FRAME ASSEMBLIES WITH
VOLTAGE REFERENCE PLANE AND IC
PACKAGES INCLUDING SAME

Examiner: D. Graybill

Group Art Unit: 2827

Attorney Docket No.: 3070.2US (96-1079.2)

*Surber
8/2/02*

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AMENDMENT UNDER 37 C.F.R. § 1.116

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Sir:

The following amendments and remarks are filed in response to the Examiner's remarks in the Final Office Action mailed May 30, 2002, the three-month shortened statutory period for response to which expires on August 30, 2002. This response is submitted on or before two months from the mailing date of the Final Office Action.

IN THE CLAIMS:

Please note that all claims currently pending and under consideration in the referenced application are shown below, in clean form, for clarity.

Please amend the claims as follows:

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1. (Three Times Amended) A semiconductor die assembly comprising:
a semiconductor die having a plurality of bond pads on an active surface thereof;
a lead frame having at least a first group of lead fingers and a second group of lead fingers to respectively extend from first and second opposing sides of said semiconductor die attached to a die-attach location on said lead frame to another, single side of said lead frame in a substantially mutually parallel configuration;
a first voltage reference plane to overlie in immediate proximity to therefrom, said first voltage reference plane overlying at least a turning portion of said first group of lead fingers extending from said first side of said [intended] die-attach location toward said another, single side of said lead frame; and
a second voltage reference plane to overlie in immediate proximity to said second group of lead fingers and in electrical isolation therefrom, said second voltage reference plane overlying at least a turning portion of said second group of lead fingers extending from said second opposing side of said [intended] die-attach location toward said another, single side of said lead frame. said first group of lead fingers and in electrical isolation
 2. The assembly of claim 1, wherein said lead frame comprises a vertical surface mount package configuration.
 3. (Previously Amended) The assembly of claim 1, wherein said first voltage reference plane and said second voltage reference plane are adhered to at least some of the lead fingers of said first group of lead fingers and said second group of lead fingers, respectively.

4. (Previously Amended) The assembly of claim 3, wherein said first voltage reference plane and said second voltage reference plane are adhered directly via a non-conductive adhesive to said at least some of the lead fingers of said first group of lead fingers and said second group of lead fingers, respectively.

5. The assembly of claim 1, further comprising a packaging material encapsulating at least said active surface of said semiconductor die.

C1 6. (Previously Amended) The assembly of claim 5, wherein said packaging material at least partially covers said first and said second voltage reference planes and said first and said second groups of lead fingers.

7. The assembly of claim 1, wherein said lead frame includes a die-attach paddle to which said semiconductor die is attached.

8. The assembly of claim 1, wherein said die-attach location comprises a die-attach paddle.

9. (Previously Amended) The assembly of claim 1, wherein said first voltage reference plane and said second voltage reference plane are electrically connected to at least one lead finger of said first group of lead fingers and said second group of lead fingers, respectively, which in turn is connected through a bond pad to a reference potential of said semiconductor die.

10. The assembly of claim 1, wherein at least one of said first voltage reference plane and said second voltage reference plane includes projections extending away from a direction of said immediate proximity of said first group of lead fingers and said second group of lead fingers, respectively.

11. The assembly of claim 10, further comprising a packaging material extending over at least one of said first voltage reference plane and said second voltage reference plane, wherein said projections extend through said packaging material.

12. The assembly of claim 11, wherein said projections extend through said packaging material to an exterior surface thereof.

13. (Previously Amended) The assembly of claim 1, wherein said first voltage reference plane and said second voltage reference plane are of sufficient mass to measurably alter heat transfer characteristics of said assembly.

14. The assembly of claim 1, further comprising a packaging material encapsulating said assembly so that only outer ends of said at least said first group of lead fingers and said second group of lead fingers extend therethrough.

15. (Previously Amended) The assembly of claim 1, wherein said first voltage reference plane and said second voltage reference plane extend over at least about fifty percent of a surface area of said at least said first group of lead fingers and said second group of lead fingers, respectively.

16. (Previously Amended) The assembly of claim 1, wherein said first voltage reference plane and said second voltage reference are separated from said at least said first group of lead fingers and said second group of lead fingers, respectively, by an insulating adhesive structure.

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17. (Previously Amended) The assembly of claim 16, wherein said insulating adhesive structure comprises an insulating film having an adhesive on opposing surfaces thereof, one surface of said opposing surfaces being adhered to at least one of said first group of lead fingers and said second group of lead fingers and another surface of said opposing surfaces being adhered to at least one of said first voltage reference plane and said second voltage reference plane.

18. (Previously Twice Amended) A vertical surface mount lead frame to be assembled to a semiconductor die, comprising:
a lead frame having at least a first group of lead fingers and a second group of lead fingers to respectively extend from first and second opposing sides of an intended die-attach location to another, single side of said lead frame in a substantially mutually parallel configuration;
a first voltage reference plane to overlie in immediate proximity said first group of lead fingers and in electrical isolation therefrom, said first voltage reference plane overlying at least a turning portion of said first group of lead fingers extending from said first side of said intended die-attach location toward said another, single side of said lead frame; and
a second voltage reference plane to overlie in immediate proximity said second group of lead fingers and in electrical isolation therefrom, said second voltage reference plane overlying at least a turning portion of said second group of lead fingers extending from said second opposing side of said intended die-attach location toward said another, single side of said lead frame.

19. (Previously Amended) The assembly of claim 18, wherein said first voltage reference plane and said second voltage reference plane are adhered to at least some of the lead fingers of said first group of lead fingers and said second group of lead fingers, respectively.

20. (Previously Amended) The assembly of claim 19, wherein said first voltage reference plane and said second voltage reference plane are adhered directly via a non-conductive adhesive to said at least some of the lead fingers of said first group of lead fingers and said second group of lead fingers, respectively.

C 21. The assembly of claim 18, wherein said lead frame includes a die-attach paddle to which said semiconductor die is attached.

22. The assembly of claim 18, wherein said die-attach location comprises a die-attach paddle.

23. The assembly of claim 18, wherein at least one of said first voltage reference plane and said second voltage reference plane includes projections extending away from a direction of said immediate proximity of said first group of lead fingers and said second group of lead fingers, respectively.

24. (Previously Amended) The assembly of claim 18, wherein said first voltage reference plane and said second voltage reference plane extend over at least about fifty percent of a surface area of said at least said first group of lead fingers and said second group of lead fingers, respectively.

25. The assembly of claim 18, wherein said first voltage reference plane and said second voltage reference is separated from said at least said first group of lead fingers and said second group of lead fingers, respectively, by an insulating adhesive structure.

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26. (Previously Amended) The assembly of claim 25, wherein said insulating adhesive structure comprises an insulating film having an adhesive on opposing surfaces thereof, one surface of said opposing surfaces being adhered to at least one of said first group of lead fingers and said second group of lead fingers and another surface of said opposing surfaces being adhered to at least one of said first voltage reference plane and said second voltage reference plane.

REMARKS

The Final Office Action mailed May 30, 2002, has been received and reviewed. Claims 1 through 26 are currently pending in the application. Claims 1 through 26 stand rejected. Applicants propose to amend claim 1 (clerical correction), and respectfully request reconsideration of the application as proposed to be amended herein.

35 U.S.C. § 112 Claim Rejections

Claims 1 through 17 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant proposes to amend independent claim 1 by deleting the word "intended" in two instances. Applicant respectfully submits that such amendment overcomes the rejection under 35 U.S.C. § 112, second paragraph, and respectfully requests the Examiner to withdraw this rejection. Applicants note that such term "intended" in claim 1 was merely a clerical mistake and respectfully requests the Examiner to use reasonable discretion and reconsider this application as proposed to be amended herein.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,113,240 to Bozzini in view of U.S. Patent No. 5,089,878 to Lee

Claims 18 through 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bozzini (U.S. Patent No. 5,113,240) in view of Lee (U.S. Patent No. 5,089,878). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or**

references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

In the rejection, the Examiner acknowledges that the Bozzini reference is deficient by stating the following:

However, Bozzini does not appear to explicitly teach a first voltage reference plane to overlie in immediate proximity said first group of lead fingers and in electrical isolation therefrom; said first voltage reference plane overlying at least the turning portion of said first group of lead fingers extending from said first side of said intended die-attach location toward said another, single side of said lead frame; and a second voltage reference plane to overlie in immediate proximity said second group of lead fingers and in electrical isolation therefrom, said second voltage reference plane overlying at least the turning portion of said second group of lead fingers extending from said second opposing side of said intended die-attach location toward said another, single side of said lead frame. (Office Action, page 3, line 20 - page 4, line 10).

The Examiner then relies on the Lee reference for teaching the above noted deficiency, stating that it would have been obvious to combine the product of Lee with the product of Bozzini because it would reduce impedance.

Applicants respectfully disagree with the Examiner's rejection for at least two reasons: First, a person of ordinary skill in the art would not have been motivated to combine the references for the reasons the Examiner suggests; second, there is no expectation of success to make the proposed combination of references; and, third, the combined references do not teach or suggest that which is recited in amended claim 18.

Turning to the first issue, a person of ordinary skill in the art would not have been motivated to combine the references. Specifically, the Examiner states that such combination would have been obvious because it would reduce impedance. However, there is nothing in the Bozzini reference that teaches or suggests impedance and/or problems relating to impedance

therein. Further, there is nothing that teaches or suggests voltage reference planes or the necessity of providing such voltage reference planes in the Bozzini reference. Rather, the Bozzini reference is directed to a monolithically formed lead frame structure that provides heat dissipation from a depressed portion 15 on which an integrated circuit may sit, wherein a bottom surface of the depressed portion is exposed through the packaged lead frame for heat dissipation. See Bozzini, column 3, lines 6-62; FIGS. 2-4. Thus, based on the objective teaching in the Bozzini reference, a person of ordinary skill in the art would not have modified the product in the Bozzini reference to reduce impedance.

Further, the Lee reference does not teach or suggest a vertical surface mount lead frame configuration. Moreover, the Lee reference does not teach or suggest utilizing a voltage reference plane arrangement that would be workable on a vertical surface mount leadframe. Rather, the Lee reference teaches trapezoidal coupons 18a 18b that completely surround a chip 2 (See FIGS. 1(a), 1(b), and 1(c)). Thus, a person of ordinary skill in the art would not have combined the teachings in the Lee reference with the teachings in the Bozzini reference because such an arrangement is not taught or suggested in the Lee reference nor the Bozzini reference.

Furthermore, even if a person of ordinary skill in the art did combine the references, such combination would result in the product in the Bozzini reference to be unsatisfactory for its intended purpose. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification (emphasis added). *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

In this case, the proposed modification would result in Bozzini having an unsatisfactory product. In particular, if the coupon arrangement disclosed in the Lee reference were provided over the lead fingers in the Bozzini reference, the coupons would not fit over the lead fingers in a manner conducive to the single-side lead frame configuration. Specifically, the trapezoidal coupons in the Lee reference surround the semiconductor chip. Such an arrangement placed over the chip in the Bozzini reference would result in some of the coupons not being disposed over the

lead fingers due to the type of single-side lead finger configuration disclosed in the Bozzini reference. In fact, the trapezoidal coupons in the Lee reference would be disposed over and beyond side 11c. Such a modification would not make sense as such modification would waste space and would not provide any reduction of impedance in the portion of coupons hanging over and beyond side 11c. Thus, Applicant respectfully submits that the proposed modification would essentially render the product in the Bozzini reference impractical and unsatisfactory for its intended purpose.

Turning to the second issue, the proposed combination of the Lee reference and the Bozzini reference would have no reasonable expectation of success. Obviousness does not require absolute predictability, however, at least some degree of predictability is required. Evidence showing there was no reasonable expectation of success may support a conclusion of non-obviousness. In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CC: MS. PAM ANDERSON (W/ENCLOSURES) 1976).

There is no reasonable expectation of success to make the proposed modification since the modification would result in the coupons 18a, 18b to be impractically situated, i.e., hanging over and beyond side 11c in the product of the Bozzini reference, as previously indicated. Such a modification would require additional modifications to eliminate the impracticality of the coupon arrangement taught in Lee reference associated with the single-side lead finger configuration disclosed in the Bozzini reference. Since the proposed modification would be impractical and result in the Bozzini reference being unsatisfactory for its intended purpose, which in turn would require additional modifications to overcome such impracticality, there is not the required predictability to make the proposed modification. Thus, Applicants respectfully assert that there is no reasonable expectation of success to make the proposed modification. Therefore, the combined references do not satisfy a *prima facie* case of obviousness.

Tuning to the third issue, even if a person of ordinary skill in the art did combine the references, the combined references do not result in the claimed subject matter. Rather,

additional modifications would be required if the Lee reference and the Bozzini reference were combined. In particular, independent claim 18 has been amended to recite as follows:

- a first voltage reference plane to overlie in immediate proximity said first group of lead fingers and in electrical isolation therefrom, said first voltage reference plane overlying at least a turning portion of said first group of lead fingers extending from said first side of said intended die-attach location toward said another, single side of said lead frame; and
- a second voltage reference plane to overlie in immediate proximity said second group of lead fingers and in electrical isolation therefrom, said second voltage reference plane overlying at least a turning portion of said second group of lead fingers extending from said second opposing side of said intended die-attach location toward said another, single side of said lead frame.

Independent claim 18 requires that the respective first and second voltage reference planes overlie at least a turning portion that extends from the respective first and second opposing sides of an intended die attach location to another, single side of the lead frame.

In contradistinction to amended claim 18, the Lee reference discloses coupons 18a and 18b overlying lead fingers that extend from each of first, second, third and fourth sides of a chip to corresponding respective first, second, third and fourth sides of a lead frame. Thus, utilizing the coupons 18a and 18b in the Lee reference with the single-side lead finger configuration in the Bozzini reference would require additional modifications to such coupons 18a and 18b in order to result in the claimed invention. Such additional modifications are not taught or suggested in the Lee reference or the Bozzini reference, alone or in combination.

Furthermore, neither the Lee reference nor the Bozzini reference teach or suggest coupons 18a and 18b which overlie a turning portion of the lead fingers which extend from a first and second opposing sides of an intended die attach location toward another, single side of the lead frame, as recited in independent claim 18.

Based on the foregoing, the Lee reference and the Bozzini reference do not teach or suggest each and every limitation recited in independent claim 18. With respect to dependent

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claims 19-26, they are patentable over the Lee reference and Bozzini reference based on at least their respective dependencies from independent claim 18.

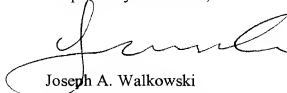
ENTRY OF AMENDMENTS

The proposed amendment to claim 1 above should be entered by the Examiner because the amendment is supported by the as-filed specification and drawings and do not add any new matter to the application. Such proposed amendment is only made to correct a clerical mistake. Further, the amendments do not raise new issues or require a further search. Finally, if the Examiner determines that the amendments do not place the application in condition for allowance, entry is respectfully requested upon filing of a Notice of Appeal herein.

CONCLUSION

Claims 1-26 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully Submitted,



Joseph A. Walkowski
Registration Number 28,765
Attorney for Applicants
TRASKBRITT, PC
P.O. Box 2550
Salt Lake City, Utah 84110
Telephone: (801) 532-1922

Date: July 15, 2002

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Enclosure: Version With Markings to Show Changes Made

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